

What is claimed is:

1 1. A method comprising:
2 computing for a path that includes multiple links a first
3 color vector that indicates colors that all of the multiple
4 links include; and

5 computing for the path a second color vector that
6 indicates colors that none of the multiple links include.

1 2. The method of claim 1 further comprising considering
2 the path for inclusion in a label switched path (LSP) if the
3 path includes all colors that must be included in the LSP and
4 does not include any colors that must be excluded from the
5 LSP.

1 3. The method of claim 1 further comprising determining
2 whether the path includes all colors that must be included in
3 a label switched path (LSP) by performing an AND operation on
4 the first color vector and a mask indicating colors that must
5 be included in the LSP and determining if a result of the AND
6 operation equals the mask.

1 4. The method of claim 1 further comprising determining
2 whether the path includes any colors that must be excluded
3 from a label switched path (LSP) by performing an AND
4 operation on the second color vector and a mask indicating
5 colors that must be excluded from the LSP and determining if a
6 result of the AND operation equals zero.

1 5. The method of claim 1 further comprising
2 automatically re-computing the first color vector and the
3 second color vector if a characteristic of any of the multiple
4 links changes.

1 6. The method of claim 1 further comprising
2 automatically re-computing the first color vector and the
3 second color vector if one or more of the multiple links
4 included in the path changes.

1 7. The method of claim 1 wherein the colors indicate
2 service characteristics of the multiple links.

1 8. The method of claim 1 wherein the path runs through
2 the Internet.

1 9. A method comprising:
2 calculating whether a path including multiple links
3 includes all colors that must be included in a label switched
4 path (LSP); and
5 calculating whether the path includes any colors that
6 must be excluded from the LSP.

1 10. The method of claim 9 further comprising considering
2 the path for inclusion in the LSP if the path includes all
3 colors that must be included in the LSP and does not include
4 any colors that must be excluded from the LSP.

1 11. The method of claim 9 in which the calculating is
2 performed automatically.

1 12. The method of claim 9 wherein calculating whether
2 the path includes all colors that must be included in the LSP
3 includes performing an AND operation on a color vector of the
4 path that indicates colors that all of the multiple links
5 include and a mask indicating colors that must be included in
6 the LSP and determining if a result of the AND operation
7 equals the mask.

1 13. The method of claim 9 wherein calculating whether
2 the path includes any colors that must be excluded from the
3 LSP includes performing an AND operation on a color vector of
4 the path that indicates colors that any of the multiple links
5 include and a mask indicating colors that must be excluded
6 from the LSP and determining if a result of the AND operation
7 equals zero.

1 14. The method of claim 9 further comprising
2 automatically determining if the path is eligible for
3 inclusion in the LSP based on whether the path includes all
4 colors that must be included in the LSP and whether the path
5 includes any colors that must be excluded from the LSP.

1 15. The method of claim 9 further comprising
2 concurrently performing the calculation of whether the path
3 includes all colors that must be included in the LSP and the
4 calculation of whether the path includes any colors that must
5 be excluded from the LSP.

1 16. The method of claim 9 further comprising first
2 performing the calculation of whether the path includes all
3 colors that must be included in the LSP or the calculation of
4 whether the path includes any colors that must be excluded
5 from the LSP, and

6 performing the other calculation only if the first
7 calculation determines that the path includes all colors that
8 must be included in the LSP or excludes all colors that must
9 be excluded from the LSP.

1 17. The method of claim 9 further comprising setting up
2 the LSP.

1 18. The method of claim 9 wherein the path includes
2 stacked LSPs.

1 19. The method of claim 9 wherein the colors indicate
2 service characteristics of the multiple links.

1 20. The method of claim 9 wherein the calculations are
2 performed when one or more of the multiple links changes.

1 21. An article comprising a machine-readable medium
2 which stores machine-executable instructions for computing
3 resource color for composite links, the instructions causing a
4 machine to:

5 calculate whether a path including multiple links
6 includes all colors that must be included in a label switched
7 path (LSP); and

8 calculate whether the path includes any colors that must
9 be excluded from the LSP.

1 22. The article of claim 21 further causing a machine to
2 consider the path for inclusion in the LSP if the path
3 includes all colors that must be included in the LSP and does
4 not include any colors that must be excluded from the LSP.

1 23. The article of claim 21 in which the calculating is
2 performed automatically.

1 24. The article of claim 21 wherein calculating whether
2 the path includes all colors that must be included in the LSP
3 includes performing an AND operation on a color vector of the
4 path that indicates colors that all of the multiple links
5 include and a mask indicating colors that must be included in
6 the LSP and determining if a result of the AND operation
7 equals the mask.

1 25. The article of claim 21 wherein calculating whether
2 the path includes any colors that must be excluded from the
3 LSP includes performing an AND operation on a color vector of
4 the path that indicates all of the colors that any of the
5 multiple links include and a mask indicating colors that must
6 be excluded from the LSP and determining if a result of the
7 AND operation equals zero.

1 26. The article of claim 21 further causing a machine to
2 automatically determine if the path is eligible for inclusion
3 in the LSP based on whether the path includes all colors that
4 must be included in the LSP and whether the path includes any
5 colors that must be excluded from the LSP.

1 27. The article of claim 21 further causing a machine to
2 concurrently determine whether the path includes all colors
3 that must be included in the LSP and determine whether the
4 path includes any colors that must be excluded from the LSP.

1 28. The article of claim 21 further causing a machine to
2 first perform the calculation of whether the path includes all
3 colors that must be included in the LSP or the calculation of
4 whether the path includes any colors that must be excluded
5 from the LSP, and

6 perform the other calculation only if the first
7 calculation determines that the path includes all colors that
8 must be included in the LSP or excludes all colors that must
9 be excluded from the LSP.

1 29. The article of claim 21 further causing a machine to
2 set up the LSP.

1 30. The article of claim 21 wherein the path includes
2 stacked LSPs.

1 31. The article of claim 21 wherein the colors indicate
2 service characteristics of the multiple links.

1 32. The article of claim 21 wherein the calculations are
2 performed when one or more of the multiple links changes.

1 33. An apparatus comprising:

2 a mechanism configured to route data between devices
3 configured to connect to a network; and

4 a process accessible by the mechanism that is configured
5 to automatically compute two color vectors for a path running
6 across the network and including multiple links.

1 34. The apparatus of claim 33 wherein the process is
2 also configured to perform the automatic computing if one or
3 more of the multiple links changes.

1 35. The apparatus of claim 33 wherein the mechanism is
2 also configured to consider the path for inclusion in a label
3 switched path (LSP) across the network if the path includes
4 all colors that must be included in the LSP and does not
5 include any colors that must be excluded from the LSP.

1 36. The apparatus of claim 33 wherein computing one of
2 the color vectors includes determining whether the path
3 includes all colors that must be included in a label switched
4 path.

1 37. The apparatus of claim 36 wherein determining
2 whether the path includes all colors that must be included in
3 a label switched path (LSP) includes performing an AND

4 operation on a color vector of the path that indicates colors
5 that all of the multiple links include and a mask indicating
6 colors that must be included in the LSP and determining if a
7 result of the AND operation equals the mask.

1 38. The apparatus of claim 33 wherein computing one of
2 the color vectors includes determining whether the path
3 includes any colors that must be excluded from a label
4 switched path.

1 39. The apparatus of claim 38 wherein determining
2 whether the path includes any colors that must be excluded
3 from a label switched path (LSP) includes performing an AND
4 operation on a color vector of the path that indicates all of
5 the colors that any of the multiple links include and a mask
6 indicating colors that must be excluded from the LSP and
7 determining if a result of the AND operation equals zero.

1 40. The apparatus of claim 33 wherein the process is
2 also configured to determine if the path is eligible for
3 inclusion in the LSP based on whether the path includes all
4 colors that must be included in the LSP and whether the path
5 includes any colors that must be excluded from the LSP.

1 41. The apparatus of claim 33 wherein the mechanism is
2 also configured to notify other devices of the computed color
3 vectors.

1 42. The apparatus of claim 33 wherein the mechanism is
2 also configured to set up a label switched path across the
3 network.

1 43. The apparatus of claim 33 wherein the process
2 includes software to automatically compute the color vectors.